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## Interns Shall Not Sleep: The Duty Hours Boomerang

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On March 10, 2017, the Accreditation Council for Graduate Medical Education (ACGME) announced revisions to its common program requirements related to duty hours.<sup>(1)</sup> Effective on July 1, 2017, the most important change will be an increase in the maximum consecutive hours that an intern may work. Interns will now be able to continuously perform patient care work up to a maximum of 24 hours with an additional 4 hours for managing care transitions. This reverses the controversial reduction to 16 hours that occurred in 2011.<sup>(2)</sup>

The regulation of house staff duty hours formally began in the late 1980s. It was precipitated largely because of the publicity resulting from the 1984 death of Libby Zion in a New York teaching hospital that was attributed partly to poor decisions made by fatigued and overworked house staff.<sup>(3)</sup> Consequently, the state of New York in 1989 passed laws restricting the maximum number of hours that house staff could work to 80 hours/week, a minimum of 8 hours between shifts and 1 day off per week.<sup>(3)</sup> Before 1987, duty hours for house staff were largely unregulated and governed only by the requirement that "Hospital duties should not be so pressing or consuming that they preclude ample time for other important phases of the training program or for personal needs."<sup>(4)</sup> Consequently, in some training programs, every other night call was mandated and in a few, residents were required to live in the hospital (hence, the historical origin of the term, "resident"). Some change occurred in 1987 when the ACGME mandated 1 day off per week and call no more frequently than every third night.<sup>(4)</sup> However, it was not until 2003 that the ACGME common program requirements were revised to restrict duty hours to 80 hours per week and a maximum of 24 hours of continuous duty with an additional 6 hours allowed for care transitions and educational activities.<sup>(4)</sup> These requirements remained in effect until 2011. At that time, in response to an Institute of Medicine report recommending a maximum work shift for all residents of 16 hours,<sup>(5, 6)</sup> and research demonstrating that interns working 24 hour shifts in comparison to 16 hours shifts made more attentional and serious medical errors,<sup>(7, 8)</sup> the ACGME reduced the maximum shift length for only interns to 16 hours.<sup>(2)</sup> It was felt that interns would be more susceptible to the impact of sleep deprivation and this would allow them to better focus on educational activities.

The limitation on interns not working more than 16 hours per day was met by several concerns from training programs, faculty and house staff themselves.<sup>(9)</sup> Perhaps the most important was the issue of "hand-offs". An inevitable consequence of reducing intern shift length was the more frequent need to transition care from one house officer to another. It was suggested that increased fragmentation of care and failure to transmit important patient care information would result. Thus, it was suggested that the potential improvement in patient safety from non sleep deprived interns would be offset by the detrimental impact of more frequent handoffs. Perhaps equally important was the argument that the educational experience of better continuity of care would be lost. This was thought to be especially important for surgical training programs where post-operative issues often occur at night. Logistical issues also were highlighted. In most cases, a 16 hour work schedule for interns necessitated a "night float" system, thought by most training programs to be a non-educational experience. Additionally, in some programs, loss of intern coverage meant greater work for senior residents and faculty.

Many residents and interns themselves were not in favor of the change because of perceived loss of educational experience and scheduling issues. Finally, the economic cost was not trivial with one estimate of an additional \$1.6 billion per year cost.(10)

Why the change back to a maximum of 24 hour shifts? Since 2011, a number of studies have been published evaluating the impact of restricting shift length to 16 hours or less. In a 2015 systematic review of 27 studies published between 2010 and 2014,(11) the authors concluded that the restriction in duty hours did not improve patient care or house staff well-being, but did negatively impact house staff education. Of particular note was that “night float” in most studies was associated with decreased attendance at conferences, time spent with the attending physician and time doing independent reading. A particularly impactful study not included in the systematic review was the 2015 Flexibility in Duty Hour Requirements for Surgical Trainees Trial (FIRST).(12) The FIRST study was a randomized cluster trial of 118 general surgery residency programs in which programs were assigned to one of two groups, adherence to the 2011 ACGME duty requirements or a more flexible policy where some ACGME duty hour requirements could be waived. Specifically, the 16 hour duty limit for interns could be exceeded; duty shifts could be longer than 28 hours; time between shifts could be less than 8 hours; and time off after more than 24 hours of continuous duty could be less than 14 hours. The study found that programs in the flexible policy arm did not experience worse patient outcomes (e.g., death or serious complications) and there were no differences in residents’ ratings of well-being and educational quality. As a consequence of the concerns raised as well as the aforementioned research findings, the ACGME convened a taskforce to review and recommend changes to its common program requirements including duty hours. The result was to increase the duty hours for interns back to 24 hours as well as additional focus on patient safety and physician well-being.(1) The remaining requirements (e.g., maximum of 80 hours/week) were essentially unchanged. However, individual specialties could impose more restrictive regulations. For example, Internal Medicine specifies workload caps limiting the number of new admissions and overall number of patients that can be under the care of an intern or resident.

Is this a reversion to former standards a step forward or has the clock ticked backwards? Despite the seeming clarity in the ACGME requirements, the answer is uncertain. There has been considerable research that documents the detrimental effects of sleep deprivation on human physical and mental performance. The evidence that reaction time deteriorates rapidly after 16 hours of continuous wakefulness is not in dispute.(13) Furthermore, it is well known that many house staff have chronic sleep debt and human performance is at its worse during the nighttime portion of the circadian cycle. In conjunction with at least 16 hours of continuous wakefulness, it is likely that many house staff are performance impaired. Why is this impairment not demonstrated in field studies? There is evidence that adverse effects related to sleep loss are variable among individuals and may involve a trait-like vulnerability. Additionally, the brain likely has a cognitive reserve which might allow some individuals to cope with the insult of sleep deprivation by using preexisting cognitive processes or by enlisting compensatory processes before performance is adversely affected.(14) This may be especially true in

those with high intelligence such as physicians. Therefore, on average, there may not be an identifiable impact of permitting shifts greater than 16 hours. However, an adverse patient care outcome can occur from a decision made by one sleep deprived intern. Given that there are strong opinions on both sides of the issue, targeted research is needed. One possibility would be to identify individuals at the extremes of vulnerability to sleep deprivation and then to determine the impact of varying shift lengths. Only with such information will the argument be put to “bed”.

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